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THE TOOL INDUSTRY IN THE NEW FIVE-YEAR PLAN

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Tool plants are increasing the output of precision measuring instruments in accordance with the demands of machine-tool building.

First among the expanding number of categories of precision instruments are mechanical lever instruments with measuring heads graduated (s tsenoy deleniya) at 0.001 and 0.002 millimeters.

The Leningrad Tool Plant is producing comparators graduated at 1 and 2 microns with 0.06- and 0.12-millimeter ranges, respectively. The comparators are mounted on pedestals and can measure parts up to 175 millimeters in height.

This plant, like the "Krasnyy instrumentshchik" Plant is producing external measuring instruments graduated at 2 microns with 0-25 and 25-30 intervals. It is also producing sensitive lever micrometers graduated at 2 microns.

The first group of measuring heads with sensitive mechanical gears, known as microkators (mikrokatorov), graduated at 1 or 2 microns having 0.06- or 0.12-millimeters range, were produced at the "Kalibr" Plant in 1947.

In addition to the universal precision instruments, tool plants are attempting to perfect the production of special-purpose instruments during the current Five-Year Plan, based on the mechanical-lever principle and having a wide range of adaptability. Such instruments include stationary-type pitch gauges for external and internal cylindrical threads, instruments for angle inspection and classification according to precision, and instruments for checking angle of taper, etc.

The "Kalibr" and Chelyabinsk Tool Plants have organized for the production of blades in two sizes for use in universal microscopes for measuring threads.

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Air gauges have become widely used in the machine-tool building industry during the past few years. For this reason, mass production of these instruments in tool plants has been organized in the current Five-Year Plan. The "Kalibr" and Leningrad Tool Plants are producing air gauges. The "Kalibr" Plant has produced the first group of precision air gauges of a new universal design on the principle of the rotameter. This principle was developed earlier by the Bureau of Interchangeability, Ministry of Machine-Tool Building USSR. Serial production of these instruments was started in 1947. The instruments are graduated in microns. Universality of the instruments is assured by the range of measurement which can be changed by a variation of air pressure or the introduction of various floats.

The new instrument, the rotameter, is twice as accurate as the "Soleks"-type and gives a uniform scale of graduation and does not require complex maintenance. The weight of the rotameter is half that of the Soleks type. Accuracy to 0.5 microns can be reached by the rotameter.

The "Kalibr" Plant is producing air gauges which are to be used for sorting pistons according to the size of piston pin holes, as well as for sorting connecting rods according to size of holes.

The number of categories of air gauges will increase with the production of multimeasuring air-gauge equipment, jet calipers (zhiklernykh kalibrov) for various dimensions, as well as pneumatic devices (ustroistv) for automatic control of machine operation in bringing working parts to within tolerance.

Electrified measuring heads in precision instruments have become widely used during the past years. Production of these heads was perfected at the "Kalibr" Plant which, in 1946, had organized series production of electro-contact measuring heads of BV design. This design mounted on a pedestal permits gauging to one micron accuracy. The heavy-duty pedestals for these measuring heads are produced with three interchangeable tables. "The Kalibr" Plant has also designed an electric contact head for multimeasuring instruments.

This plant, together with the All-Union Electrical Engineering Institute, is conducting work on an electric gauge indicator (datchikam) for use in signal-light type instruments, and for all kinds of sorting equipment.

An electroinductive measuring head, graduated at intervals of 1 and 0.5 micron (0.001 and 0.0005 millimeters), was produced in 1947 by the "Kalibr" Plant. It can be used as a universal instrument when mounted on a pedestal, or as a special attachment (priaposoblenlye).

Electromeasuring heads when mounted on conventional pedestals become universal measuring instruments. Electrified measuring instruments in the future must be adaptable in all types of multimeasuring, sorting, and automatic devices.

Because of the development of mass and continuous production, it is necessary to increase the uses of high-production measuring devices to improve the productive capacity of control operations in machine building. Among the devices are multimeasuring instruments, control, semiautomatic and automatic machines for sorting finished and semifinished working parts.

Modern machine-building technology requires a high degree of tolerance control during machining. For this reason, the type of gauging techinques which have been used thus far only for checking finished products and locating flaws, must be adapted to the control of parts during machining, as an effective method of preventing rejects. These devices for automatic control of working-part dimensions during machining not only control machine operation, but also stop the machine when the fixed size of the working part has been reached. With this in view during the current Five-Year Plan, the

"Kalibr" and Leningrad Tool Plants are expanding the production not only of automatic sorting machines, but also of automatic and semiautomatic gauging devices for the control of parts during machining as well as for a number of other uses.

Multimeasuring and automatic devices will, for the most part, be produced on special orders. It is necessary to standardize and unify basic units of automatic devices to insure more efficient operation.

Tool plants must augment production of such automatic machines equipped with electromeasuring heads as electrocontact, induction and pneumatic machines, which have been perfected in mechanical principle and have been designed for the purpose of inspecting finished working parts, and sorting them according to size prior to assembly. This expediency is utilized when it is impossible to use contact thickness gauges (shchupov).

An electronic automatic machine, in comparison with mechanical automatic machines, has a number of substantial advantages. It permits not only sorting of working parts during checking, but also the use of automatic devices, guaranteeing the manufacture of parts within tolerance (predelakh).

For this reason, electrocontact and inductive measuring heads must be basically standardized units for use in a variety of multimeasuring and automatic measuring devices for sorting working parts, as well as in devices which automatically control dimensions during machining of parts.

Small-volume production of automatic machines, based on the mechanical principle, is planned for the current Five-Year Plan. Such automatic machines are being produced by the "Kalibr" Plant for sorting simple mass-produced parts, mainly for the ball-bearing industry.

Electrocontact heads such as those produced by the "Kalibr" Plant will be the basis of further designs of multimeasuring and automatic devices. With these heads, it is possible to assemble various types of high-production measuring instruments which are being improved by the NIEL, MTM (Ministry of Heavy Machine Construction), "Kalibr" /sic/.

The NIEL laboratory has produced multimeasuring instruments with the use of the "Kalibr" Plant electrocontact heads for checking 13 sizes of pistons, and four automatic machines for sorting according to size of needles of rolling bearings, piston rings, and other parts.

The "Kalibr" Plant produced two types of instruments for checking pistons of the "Moskvich" automobile engine. One type uses three electrocontact heads for checking the grinding (protochek) of pistons (electroinductive instrument graduated to 1 and 0.5 micron, made by "Kalibr" Plant), and the other type uses electrocontact heads for checking outside diameters of pistons, and a micrometer for sorting pistons according to the /piston/ skirt.

Based on electroinductive measuring heads, the "Kalibr" Plant has produced, among other instruments, comparators of the signal-light type, with 0.001- and 0.0005-millimeter range, for sorting automobile pistons into five groups.

In 1946, the NIBV produced two types of gauges for automatic machine control which incorporated modifications of electrocontact heads; an automaton for checking diameter of round pins at the "Stankonormal'" Plant, and an automaton for checking height of special parts. The former automaton checks pins according to the diameter in two sections, and sorts them into three groups: (1) suitable, (2) with flaws which can be corrected, and (3) rejects. This automaton can be adjusted to check parts according to diameter from 3 to

10 millimeters, and according to length from 10 to 100 millimeters. The productive capacity of the automaton is 2,400 parts an hour. The other automaton sorts parts according to height into three groups. The interchangeable gauging units permit adjustment of the automaton for checking parts of different dimensions. The tolerance is 1 micron.

The cited examples show with what success it is possible to utilize electrocontact heads being produced by the "Kalibr" Plant as standard units for multimeasuring instruments and automatic devices, which have not been fully introduced into plant practice but nevertheless have great possibilities.

The "Kalibr" Plant and NIBV are faced in the current Five-Year Plan with the task of developing instruments and automatically controlled machines for mass production of automobile and tractor parts and for other fields of production.

In 1946-47, tool plants entered into the production of automatic devices for checking parts during machining.

In 1946, the "Kalibr" Plant produced gauges having electrocontact heads for automatic checking of grooves (zholobov) of ball races during machining on NIBV machines (designed by Plotkin). The gauge automatically changes the machine from coarse feed to finishing /feed/ and upon reaching the fixed size, stops the machine.

In 1947, the Chelyabinsk Tool Plant produced instruments with electrocontact heads for checking thickness gauge blades (shchupovoy lenty) during the process of rolling.

Scientific research organizations and tool plants must, during the current Five-Year Plan, develop and get into production automatic checking devices for parts being machined. These devices which must be produced will be used for checking elements of thread in threaded parts, elements of grooves, elements of tooth profiles in gears, etc. Measuring adaptors for automatic stopping of machines upon reaching the specified tolerance, and multimeasuring high-production automatic adaptors for checking parts of a complex form, guaranteeing synchronized checking of several elements of a part must likewise be developed.

Until now the chief products of tool plants were adjustable tooth-measuring instruments. During the current Five-Year Plan, tool plants must perfect the production of stationary instruments and adjustable tools of various categories.

For use with stationary machines, new instruments for checking vibration of center distance in close meshing (v plotnom zatseplenii), for checking uniformity of pitch circle, universal involute gauges, instruments for checking angle of tooth taper, and instruments for checking pitch and contour of worm hobs and worms are being perfected.

The number of types of adjustable instruments being produced is also increasing. Checking devices for determining variation in length from standard specifications, micrometers for checking gear pitch for standard specifications of various dimensions, a set of module collars (nabor modul'nikh sedel), etc., are being perfected.

Stationary tooth-measuring instruments are being produced by such plants as the MIZ (Moscow Tool Plant). In 1947, the MIZ produced for the first time a group of new-type instruments for checking gears. Series production of these instruments is being organized at present. The following instruments have been produced: an involute gauge, an instrument for checking tooth -

profile of spur gears, and an instrument for checking backlash and pitch in gear wheels. The MIZ involute gauge has been designed on the principle of disc rolling on a straight edge (lineyke) without sliding. It differs from similar instruments in its straightness, and has two indicators for checking both sides of a tooth. Interchangeable adaptors are specified for checking gears of various modules. Disc rolling fixtures are interchangeable. The instrument is designed for checking tooth profile of spur gears with straight and helical tooth diameter from 40 to 240 millimeters.

The instrument for checking gear wheels for backlash (bieniya) and pitch are designed for checking radial' backlash (radial'nogo bieniya) of the original diameter of spur wheels with straight and helical teeth. It is possible to check uniformity of wheel circle pitch with the aid of attachments. This instrument can be used to check gear wheels with a module from 1 to 10 millimeters, idle wheels (nasadnyye) with a diameter from 40 to 300 millimeters, and rolls with a diameter to 240 millimeters and longitudinal shaft to 200 millimeters.

Series production of instruments for checking gear wheels by a method of rolling with a master gear was organized at the "Kalibr" Plant in 1946-47.

Production of indicating checking devices for determining deviation in length from standard specifications of spur wheels, as well as a measuring device for checking uniformity of circle pitch of spur, bevel, and other gears was organized at the Leningrad Tool Plant in 1947. Production of micrometers for checking pitch according to standard specifications for gears of small modules was organized at the "Krasnyy instrumental'shchik" Plant.

Conforming with the new trend in production, there is emerging an organized postwar production of instruments for measuring cutting tools. The Moscow Tool Plant in particular is concentrating on the production of these instruments.

In the field of producing instruments for checking geometrical characteristics of cutting tools, it is necessary to note the series production at the MIZ of Babchinitser angle gauges for measuring the undercut and back angles of the cutting edge of multiblade tools (cutters, reamers, etc.), instruments for checking undercut angles of the cutting edge of broaches, round, and standard cutters. This plant produced the first group of instruments of NIAV design for checking undercut angles of round threading dies.

The ZIL-7 produced a series of instruments for checking ridges on files in 1947.

The development of series production, which has special significance in national economy, also requires the manufacture of special measuring devices thereby assuring the checking of a number of important parts of mass or special production.

Tool plants are faced with the task of adapting production of measuring devices for large dimensions in heavy and transport machine building, aviation industry, etc.

The production of sliding calipers, micrometers, inside caliper gauges, and gauges of especially large dimensions is foreseen. Tool plants produced a number of such tools in 1946-47. The Novosibirsk Tool Plant produced a series of sliding calipers for measuring lengths from 1 to 3 meters, the Chelyabinsk Tool Plant, inside caliper gauges above 500 millimeters, the "Kalibr" Plant, micrometers having a range of measurement to 1.6 meters, and a set (nabor) of end measures, up to 1.6 meters; the "Krasnyy instrumental'-shchik" Plant, height gauges to 1,000 millimeters.

The tool plants perfected the production of smooth and threaded gauges of various categories for measuring Briggs thread and API threads. Thus, the "Kalibr" Plant produced smooth and threaded bevel gauges for API thread on pipes with dimensions to 16 3/4 inches.

Tool plants must develop and perfect the production of a number of other universal measuring instruments for checking holes, flat surfaces, etc., during the current Five-Year Plan.

It is clear from the above that during the current Five-Year Plan it will be necessary for tool plants, the NIBV and other scientific research organizations to develop and organize (naladit') the production of a number of multiple checking and measuring tools and instruments. This project will require great effort on the part of toolmakers in designing and organizing the production of these measuring devices.

The question on the production of instruments for checking surface quality and a number of other instruments, the production of which belongs to plants of other ministries, is not discussed here.

Problems concerning increased durability of cutting tools must be solved by improving the quality of tool steel which has been furnished by the Ministry of Ferrous Metallurgy and Hard Alloys, and the Ministry of Nonferrous Metallurgy. In addition, it is necessary to increase the production of certain types of abrasives for grinding hard alloys.

To guarantee the quality of tools and instruments, in accordance with the high level of development of science in cutting and measuring technology, it is necessary to work out new and modify existing specifications, and departmental standards, as well as the operating particulars of the tool. This work must be conducted by tool plants together with consumers of tools and with scientific research organizations which are conducting experimental work on tools and instruments.

In the field of measuring technology, an especially large task lies ahead in designing and producing checking and sorting automatic machines, and automatic and semiautomatic devices for checking parts during machining, the perfection of which demands a very complex tool-designing process. In this field it is necessary to conduct a great deal of work with many scientific research organizations and with the All-Union Electrical Engineering Institute. To accelerate the development of automatic machines, the Ministry of Electrical Industry must supply tool plants with electronic equipment (boosters, electronic relays, etc.).

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